INSTALLATION AND OPERATING INSTRUCTIONS FOR BABCOCK ESCAPEMENTS

Babcock Controls Inc. manufactures 5 escapements. These are the standard of the industry. Over 200,000 of various types are in use:

TYPE EM-1 - $4.95 - 3 VOLT - 8 OHM: This is a two position self neutralizing escapement and can be used for motor control, rudder or any other function requiring 2 positions. Has 2 neutral positions.

TYPE MMH - $5.95 - 9 VOLT - 100 OHM: This escapement is identical with the EM-1 except for its higher voltage. Its use is primarily for motor control with the Babcock BCR-18.

TYPE MARK II - $8.95 - 3 VOLT - 8 OHM: This is a 3 position compound escapement with a single neutral. Can be used with a type EM-1 on third position for elevator or motor control. Can also be used for "Kick up" elevator on third position to which can be added an EM-1 to the "quick blip" position for motor control.

TYPE MARK V - $9.95 - 3 VOLT - 8 OHM: This is a four position compound escapement for right-left rudder and up-down elevator. A Type EM-1 can be added for "quick blip" motor control.

TYPE MARK VI - $11.95 - 9 VOLT - 100 OHM: This escapement is identical operationally with the Type Mark V. It is intended primarily for operation with the BCR-18 and MMH. Made to closer tolerances for use with 9 volt "relayless" receivers. The "quick blip" switch is brought out separately for use with BCR-18 receiver (See BCR-18 instructions).

I. TYPE EM-1 INSTALLATION AND OPERATING INSTRUCTIONS: The Babcock Motor Minder, with its low price and ease of operation, places reliable motor control within the reach of every modeler. It can also be used as self-neutralizing escapement for rudder or elevator control.

It is dsigned to operate on 2 or 3 volts using rubber for power. Its magnetic efficiency is great enough to utilize the power of a strong rubber band.

A. **Installation:** The escapement should be mounted securely using the two holes in the micarta base. Any convenient position can be used but it is best to have the rubber leading straight back from the shaft. For motor control a 4"-6" loop of 1/8" rubber should provide plenty of power. 3/16" or 1/4" rubber can be used if deemed necessary.

B. Usage:

1. **With Throttle-Equipped Engines:** The Motor-Minder is designed to be used primarily as a mechanical actuator for throttle-equipped engines.

Mount the escapement perpendicular to the desired travel. Use wire as a push rod, coupling it directly to the actuating shaft on the engine.

2. **As a Self-Neutralizing Escapement:** (See Figure 1). The Motor-Minder can also be used as a single basic rudder or elevator control. For this purpose, a loop of 1/4" rubber is recommended. Length should be approximately 10% longer than the distance from the shaft to the winding hook at the rear of the fuselage. Minimum friction in the torque rod is desirable so as not to waste power. Using the escapement in this manner, one pulse and hold will take it to the next position. When released, the control will return to neutral.

II: TYPE MMH INSTALLATION AND OPERATING INSTRUCTIONS: The MMH Motor-Minder is installed and operates exactly as the Type EM-1 Motor-Minder except operates on 9 volts.

III: TYPE MARK II INSTALLATION AND OPERATING INSTRUCTIONS: This escapement is a precision piece of Babcock radio control equipment engineered to give long life, trouble-free operation. Designed to operate as an actuating mechanism in any powered model, it offers more power, longer battery life with less weight than heretofore possible.

All necessary installation parts are supplied. Complete satisfaction is guaranteed if accurate installation is made in accordance with the following recommendations. For control of its four functions, no sequence of function is necessary—the same command always gives the same control.

While a wide variety of installations are possible, the following more common methods are suggested for best results.

A. **Installation:** Use care to see that rudder and elevator torque rods (see Figure 2) are aligned at right angles to face of escapement. This will prevent binding. All linkage should be moved manually before installation of control arms to insure freedom of movement. Pay particular attention to control surface hinges.

Actuating rubber should lead as straight away from rubber hook as possible. The Mark II is tested to operate on 1/8", 3/16", or 1/4" rubber. Rubber should be about 20% longer than the spacing between escapement hook and tail hook. Some modelers prefer balsa rods and others use all wire. If using wire, 3/64" is satisfactory on small models—1/16" on large.

Required voltage for the Mark II is 3 volts. For smaller airplanes, two pencells in series are generally used. For larger airplanes, two "C" or "D" cells will give longer life.

B. **Use with Secondary Escapement:** Figure 3 is a simplified schematic of the compound escapement used with Babcock Universal Motor Control Escapement on third position of the compound.

C. **Use as a Rudder and Elevator Servo without a Secondary Escapement:** The Babcock Mark II Super Compound escapement may be used to obtain "right" and "left" as noted, and also "up" elevator on the third position by mounting the elevator linkage as shown in Figure 2. Elevator should be so arranged that when crank arm slips off elevator linkage, following 3rd position, elevator returns to neutral. Thus one pulse and hold is right, two pulses and hold is left, three pulses and hold is up elevator. In all cases the super compound returns to its original neutral position—no sequence to remember. This mode of operation is successfully used in small 1/2A aircraft. Loops and "flared out" landings are easy with this set-up.

D. **The 4 Function Compound Escapement Connection:** The schematic of Figure 4 shows a satisfactory arrangement used by many modelers. This way a single channel radio will give motor control in addition to above mentioned rudder and elevator functions. It involves the use of the back contact of the relay as shown. In this case, the secondary escapement switch is moved to a new position as follows:

1. First escapement position is right rudder. With escapement held in this position, bend the switch wire on the shaft so it closes and opens again just prior to reaching right rudder position. Under no circumstances should this switch be closed at the time the escapement has reached the "right" position.

2. As the schematic indicates, the secondary escapement can work only when receiver relay is de-energized and compound switch is closed. In operation, an extremely short pulse (and release) on the transmitter button will operate the secondary escapement. This operation is as follows: The relay in the radio returns to its back contact. As the compound switch passes closed position an instantaneous pulse operates the motor speed control. Thus an extremely short pulse and release gives a change in motor speed. One pulse and hold gives right, two pulses and hold is left, three pulses and hold is up elevator. In all cases, the super compound returns to the same neutral. Again, no sequence to remember.

IV. TYPE MARK V INSTALLATION AND OPERATING INSTRUCTIONS: This Mark V "Hyper"-formance Compound Escapement is an adaptation of the famous Babcock Mark II Super Compound Escapement and is another precision piece of Babcock radio control equipment engineered to give long life and trouble-free operation.

The versatile Mark II three position control has been expanded in the Mark V to give full four-position surface actuation control — left rudder, right rudder, up elevator, down elevator plus motor speed control, using the Babcock EM-1 "Motor-Minder" — all from a single channel radio. Here is "multi" performance with the simplicity, reliability and low cost that only single channel offers.

A. **Mounting and Battery Requirements:** Use care to see that rudder and elevator torque rods (see Figure 5) are aligned at right angles to the phenolic mounting plate, so that the rods are free to move mechanically, before installation of the brass control arms, to insure freedom of movement. Be sure that the control surface hinges move freely and evenly. Some modelers prefer balsa rods, and others use piano wire. If wire is used, 3/64" is satisfactory on small models, 1/16" on large ones. The actuating rubber should lead as straight away from the rubber hook as possible. The Mark V is tested to operate on 3/16" and 1/4" rubber, the 1/4" being recommended for best operation. The rubber should be about 20% longer than the spacing between escapement hook and tail hook.

Required voltage for the Mark V is 3 volts. For smaller airplanes, two pencells in series are generally used. For larger airplanes, two "C" or "D" cells will give longer life. Battery connections must be reliable and the best method is to solder the leads directly to the batteries using a little flux and a hot iron.

Bonding of the Mark V escapement must not be omitted. Proper bonding of the unit is not difficult and it will make the difference between solid, positive operation and intermittent operation. To bond your Mark V, solder a two inch length of light flexible stranded wire or metal braid from each brass actuating arm to the 13/16" brass spacer. Solder at both the arm and at the spacer and allow enough flexibility in the bonding wires to allow free movement of the brass actuating arms. (See Figure 5).

In relay type receiver operation, one additional step is necessary. A 47 ohm resistor (included) should be soldered between solder terminals (2) and (3). See Figure 5. Insert the resistor close in to the solder terminals. This resistor prevents arcing of the receiver relay contacts, which can cause intermittent operation.

B. **Regular Four Position Installation:** Refer to Figures 8, 9, 10, 11, 12. The Mark V can be mounted horizontally, as shown, or can be mounted vertically. Vertical mounting is used in many of the "midget" planes now so popular. In either mounting, the elevator surface must be held in neutral with a spring. This is easily done with a 3/64" spring wire or piece of flat spring stock. Be sure to make a limit stop for the elevator so that it can go only as high as the elevator linkage arm will move it to prevent over travel when stunting and when your model is upside down. The elevator torque rod should be attached to the left-hand side of the elevator, rather than the right-hand side, as is done in the Mark II. This gives a sequence of control, neutral, right rudder, up elevator, left rudder, down elevator and neutral again, as shown in Figures 8, 9, 10, 11 and 12. The rudder linkage should be mounted centrally, such that in neutral position the crank arm is positioned half way between the sides of the linkage. Very light 3/64" wire centering springs can be used on the rudder. Position the elevator linkage carefully so that in neutral, the crank arm is engaged exactly in the right angle corner (point "A") on Figure 8.

C. **Use with Motor Control:** (See Figure 7). The Mark V Hyper-Compound Escapement works very well with motor control escapements such as the Babcock EM-1 "Motor-Minder." "Quick blip" motor control operation is possible, and is accomplished by setting the wire whisker contact switch so that it closes and opens while the crank arm is traveling from neutral to position one. This adjustment is made at the factory. Be sure that the switch is not closed in the position one (right) position. A look at the schematic, Figure 7, will show that the motor control can only work when the receiver relay is de-energized and when the whisker switch is closed. In either case, the sequence of control surface functions is always the same, right, up, left, down and neutral.

D. **Relayless Receiver Operation:** Follow the instructions of the manufacturer of the receiver in regard to battery sizes, etc. The 47 ohm resistor is not needed across the coil in relayless operation. In general, no special circuits are required for regular operation as in Figure 6. You will not have a "back contact" to use, with a relayless receiver. Some modelers have added an extra set of contacts on the escapement, one on the armature and one on the Phenolic. These contacts are adjusted to be closed when the escapement is de-energized. A connection is made to use these extra contacts much like a regular receiver relay back contact in "quick blip" operation.

E. **"Stick Box" Control:** It takes a little practice to hand-key your transmitter and get proper operation from your Mark V, but it is not difficult and the sequence is always the same. The four functions are a "natural" for stick box control, and the Mark V will work perfectly with the Babcock BCC-6 "Electro-stick."

It is only necessary to pace the speed of the stick box to the speed of the Mark V, remembering that the Mark V slows down somewhat as the rubber unwinds. The basic speed of the Mark V is set by the brass rocker arm which engages in the 6 pointed star gear. You can slow down the Mark V speed by gently bending together the two arms of the rocker.

Ken Willard, famous modeler and author, flew this escapement to the very top; winning First Place in the 1959 Nationals in the Intermediate Class. Good Flying!

V. TYPE MARK VI INSTALLATION AND OPERATING INSTRUCTIONS: This scapement is identical operationally with the Mark V except that it is used with **9 volt** relayless receivers such as the Babcock BCR-18. Both of the "quick blip" contacts are brought out to permit motor control with this type of receiver. (See Figure #13 for connections).

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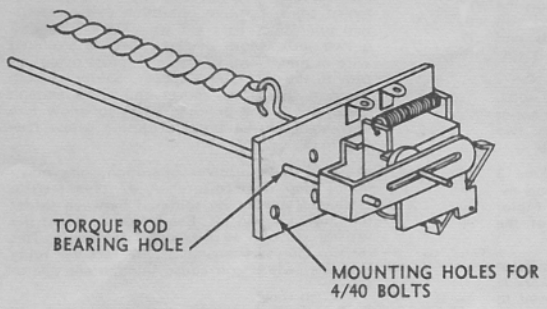


Figure 1

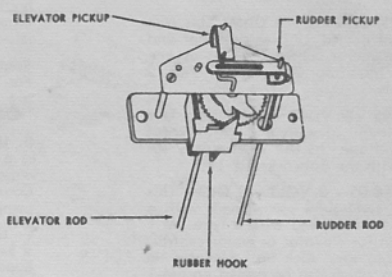
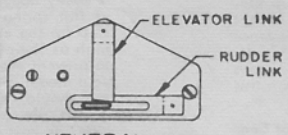
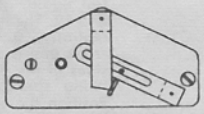


Figure 2



NEUTRAL



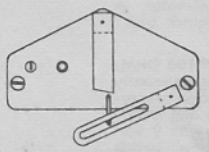
TWO PULSES-LEFT

Solder linkages to torque arms in neutral position as shown.

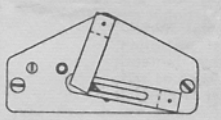
Install stop on elevator surface to prevent it from going below neutral.

Important: *All bearings and hinges must allow free movement.*

Figure 2A



ONE PULSE - RIGHT



THREE PULSES
UP ELEVATOR

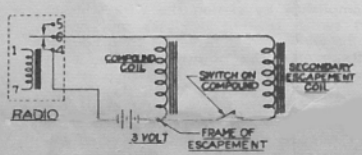


Figure 3

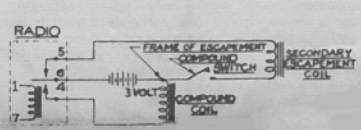


Figure 4

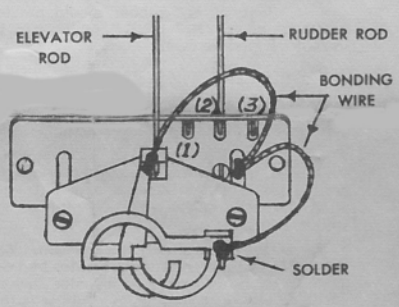


Figure 5

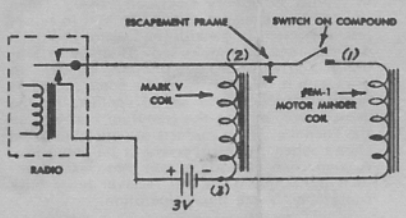


Figure 6

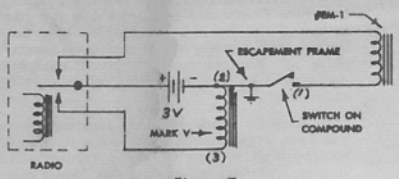


Figure 7

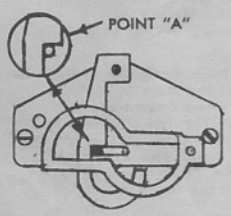


Figure 8 Neutral

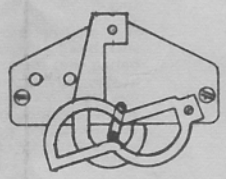


Figure 9 Right

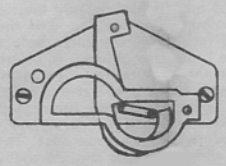


Figure 10 Up

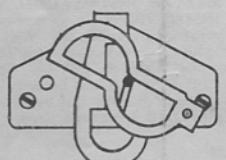


Figure 11 Left

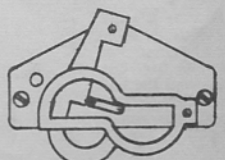
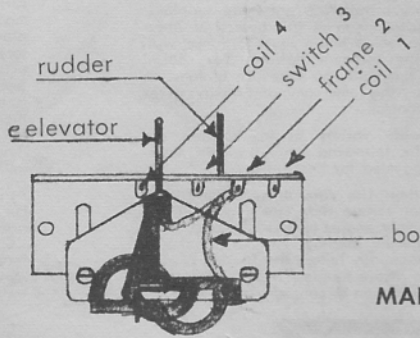


Figure 12 Down



MARK VI

Figure 13